EXECUTIVE SUMMARY

The Bluff Street (SR-18) Corridor is a vital transportation link in western Washington County through the St. George metropolitan area. The corridor begins at I-15 in the City of St. George and runs northerly for a distance of approximately 51 miles terminating at the Beryl/SR-56 junction in Iron County. It is the main transportation link connecting St. George to the adjacent cities of Santa Clara and Ivins as well as areas further to the north including Dameron Valley, Diamond Valley, Pine Valley, Veyo, Central, and Enterprise.

The Bluff Street Corridor Study focuses on the first dozen or so miles of the corridor through what is generally considered as the St. George metropolitan area from I-15 to about Dameron Valley. Special emphasis is given to the I-15 interchange as well as the key intersections of Main St, St. George Blvd, Sunset Blvd, and Snow Canyon Pkwy/Red Hills Pkwy.

Goals and Objectives

The primary goals and objectives of the Bluff Street Corridor Study were developed in conjunction with the project team made up of representatives from UDOT, the City of St. George, the Dixie Metropolitan Planning Organization (Dixie MPO), and Horrocks Engineers. The goals and objectives are to provide concepts to meet the current and future travel demand for the corridor. These include the following:

- Establish the importance of the corridor in the context of regional transportation
- Identify and define the functional classification for the corridor
- Recommend short and long term improvement needs
- Make recommendations for moving concepts forward to environmental analysis, corridor preservation, and improvement projects
- Identify known environmental resources within the area of the proposed improvement concepts
- Identify right-of-way needs

Study Approach

The study approach was to follow the above methodology to look at the entire corridor to assess corridor wide needs and then focus on key individual areas with more detailed analysis and investigation. As such, this study examines the following corridor components:

- Bluff Street Corridor between I-15 and Snow Canyon Pkwy/Red Hills Pkwy
- Bluff Street Corridor between Snow Canyon Pkwy/Red Hills Pkwy and Diamond Valley
- I-15 Interchange Area
- Main St Intersection
- St. George Blvd Intersection
- Sunset Blvd Intersection
- Snow Canyon Pkwy/Red Hills Pkwy Intersection

BLUFF STREET CORRIDOR

The existing corridor is generally a five lane section (two travel lanes in each direction with a center median two-way left turn lane) between I-15 and Snow Canyon Pkwy/Red Hills Pkwy. The corridor is classified as an urban arterial with regular signal spacing, numerous driveways and a 35 mph speed limit. The existing right-of-way width through this segment varies from about 100 to 200 feet. North of Snow Canyon Pkwy/Red Hills Pkwy, the corridor narrows to a two lane section (one lane in each direction). This segment is classified as a rural arterial with a speed limit of 55 mph and has a right-of-way width that varies from 200 to 300 feet.

Traffic Volumes

The base year used in the corridor study was 2005. Year 2005 traffic volumes were obtained by UDOT. The volumes on the corridor have been increasing at a rate of approximately 5% per year and it is anticipated that the growth will continue at that rate based on the regional growth projections. The future Average Daily

Traffic (ADT) volumes were developed using the Dixie MPO QRSII regional travel demand model. In developing the future projections, it was assumed that other regional and local improvements have been made consistent with the Dixie MPO Long Range Plan and the City of St. George Master Traffic and Transportation Study. Future projections were developed for the years 2015 and 2035 and are shown in Table ES-1.

Table ES-1: Average Daily Traffic (ADT) Volume Projections

Segment	Existing ADT (veh/day)	Projected 2015 ADT (veh/day)	Projected 2035 ADT (veh/day)
I-15 Interchange	40,000	60,000	70,000
Main St to St. George Blvd	30,000	35,000	45,000
St. George Blvd to Sunset Blvd	45,000	50,000	55,000
Sunset Blvd to Snow Canyon Pkwy/Red Hills Pkwy	20,000	30,000	35,000
North of Snow Canyon Pkwy/Red Hills Pkwy	10,000	15,000	30,000

The existing corridor will not be able to accommodate the projected 2015 or 2035 planning level traffic volumes at an acceptable level of service (LOS "E" or higher) without some type of improvement. A balanced approach for implementing the Bluff Street corridor improvements as well as other regional transportation improvements is critical to managing the projected local and regional travel demand.

Alternatives Considered

The future projected traffic volumes as well as the City of St. George Master Traffic and Transportation Study indicate that Bluff Street will need to be a seven lane section from I-15 to Snow Canyon Pkwy/Red Hills Pkwy by the year 2030 in order to handle the projected growth. North of Snow Canyon Pkwy/Red Hills Pkwy, a four lane section is sufficient due to the limited access and development along the corridor. However, due to the normally high speeds and long trip lengths on this segment of the corridor, grade separated accesses should be implemented at all major access points. This is already happening with the construction of the Ledges interchange (under construction) and the Trails interchange (planned for 2007). This same philosophy should be extended to the other major access points along this segment of the corridor where appropriate.

Several alternatives were considered to examine the ways additional capacity could be added to the segment between I-15 and Snow Canyon Pkwy/Red Hills Pkwy to meet the projected long range travel demand for the corridor. Most of these focused on some type of corridor widening improvements as other TDM/TSM alternatives could not meet the future traffic demand. The alternatives considered included:

- A five lane cross section with strict access control, a raised island center median, and exclusive turn lanes at major intersections
- A modified five lane cross section (three travel lanes in one direction and two travel lanes in the other direction) with strict access control and exclusive turn lanes at major intersections
- A six lane cross section (three travel lanes in each direction) with strict access control and exclusive turn lanes at major intersections
- A seven lane cross section (three travel lanes in each direction with a center median two-way left turn lane) with exclusive turn lanes at major intersections

Bluff Street Corridor Conclusions and Recommendations

The analysis of the 2015 and 2035 traffic demands on the corridor indicate the following improvements as summarized in Table ES-2 are needed to accommodate the projected volumes. Additional discussion of the key intersections is provided in the various sections of the report.

Table ES-2: Bluff Street Corridor Recommendations

Segment	Functional Classification	2015 Planning Level Needs	2035 Planning Level Needs
Main St to St. George Blvd	Urban Principal Arterial	5-lanes	7-lanes
St. George Blvd to Sunset Blvd	Urban Principal Arterial	7-lanes	7-lanes with grade separation at key intersections
Sunset Blvd to Snow Canyon Pkwy/ Red Hills Pwky	Urban Principal Arterial	5-lanes	5-lanes with grade separation at key intersections
North of Snow Canyon Pkwy/Red Hills Pkwy	Regional Principal Arterial	4-lanes with grade separation at key intersections and a center turn lane at minor intersections	4-lanes with grade separation at key intersections and a center turn lane at minor intersections

The main environmental concerns associated with the corridor are related to property impacts and potential relocations. Other issues that may be present are cultural resources (archaeology and paleontology), Section 4(f) resources (park, golf course, historic structures), and T&E species (desert tortoise). As several of these improvements will be needed by 2015, the NEPA environmental process should be initiated accordingly. The estimated cost to improve Bluff Street is $8,000,000 between Main Street and St. George Blvd and $13,000,000 between St. George Blvd and Snow Canyon Pkwy/Red Hills Pkwy.

I-15 INTERCHANGE

The existing interchange at Bluff Street is a traditional diamond interchange with the northbound and southbound ramp intersections on the cross street spaced at approximately 1,300 feet apart. The on and off ramps are all single lane ramps with shoulders. The northbound and southbound intersections at Bluff Street are both controlled by signals. I-15 is grade separated passing under Bluff Street. The interchange influence area extends from the Convention Center Drive intersection to the Main Street intersection along Bluff Street and to the Hilton Drive intersection on Black Ridge Drive. There are five signalized intersections in this area that are integrated into a single system.

Existing and Future Traffic Volumes

The existing traffic counts show that the Main Street intersection services nearly 5,000 vehicles in the PM peak hour which is the highest volume of traffic in the study area. The 2005 ADT reported by UDOT on Bluff Street south of the Main Street intersection is approximately 40,000 vpd. The Dixie MPO's travel demand model was used to estimate year 2015 and 2035 traffic volumes. The travel demand on Bluff Street between Main Street and the I-15 interchange will grow to about 60,000 vpd in 2015 and to over 70,000 vpd by year 2035. The overall traffic demand will grow by about 50% in the next 10 years.

Interchange Improvement Alternatives

A separate analysis was performed for the future years 2015 and 2035. The 2015 analysis focused on relatively minor improvements to the existing infrastructure. The 2035 analysis compared those minor improvements to a major interchange reconstruction. Three main interchange types or configurations were evaluated in the analysis:

- A Single Point Interchange (SPI)
- A partial clover leaf or loop ramp interchange
- A modified diamond or tight diamond urban interchange

Results of the interchange evaluation indicated that the conversion of the Bluff Street interchange to a tight diamond urban interchange will provide the capacity for the 2015 travel demand. The 2015 concept includes the following elements:

- Modify the interchange to a tight diamond urban interchange
- Widen Bluff Street including the bridge over I-15 to provide three through lanes
- Spot intersection improvements at Convention Center Drive to add turning lanes
- Spot intersection improvements at Main Street to add turning lanes

The interim interchange improvements analyzed in the year 2015 can only service about 70% of the total demand in 2035. Therefore, in order to serve the 2035 travel demand, additional capacity is required outside the Bluff Street Corridor. In order to meet the regional travel demands in the area, a concept was developed to provide a new interchange at Dixie Drive. This concept involves realigning Dixie Drive south of the Santa Clara River to provide a new interchange on I-15 between the Dixie Center and the Santa Clara River. The Bluff Street interchange and the new Dixie Drive interchange would be connected via a system of one-way collector-distributor (C/D) roads. The addition of a new interchange at Dixie Drive provides sufficient capacity to meet the 2035 projected travel demands. This concept is shown in Figure ES-1.

Bluff Street Interchange Conclusions

The reconstruction of the existing Bluff Street interchange to a tight diamond urban interchange with widening of the bridge and adjacent intersections as presented in the 2015 concept does satisfy the area's travel demands for about the next ten years of growth. It is recommended that the necessary environmental studies be started immediately so that the improvements can be implemented as soon as possible. The estimated costs for these improvements is $14,000,000.

The 5% annual growth rates in the area, however, will overburden the improved interchange by the year 2015. In order to meet the 2035 traffic demands, a new interchange at Dixie Drive is needed in addition to the improvements at the Bluff Street interchange. Together, the improved Bluff Street interchange and the new Dixie Drive interchange will provide sufficient capacity for the area's travel demands for many years to come. Potential environmental challenges include impacts to the floodplains of the Santa Clara River, impacts to the Southgate Golf Course (a section 4(f) resource) and property acquisition from adjacent landowners. The NEPA process for the Dixie Drive interchange should be initiated in the appropriate year so that it could be constructed by the year 2020 at the latest. The estimated costs for these improvements is $70,000,000.

MAIN STREET INTERSECTION

The travel demand for this area of Bluff Street is currently about 27,000 vpd north of Main Street and about 40,000 vpd south of Main Street. This is a critical link for the St. George area because the traffic going to the I-15 interchange has to pass through this intersection. The operation of this intersection affects the operation of the adjacent Bluff Street interchange and vice-versa. Maintaining efficient traffic operations through this intersection will be very important in ensuring that the long term traffic demands for the Bluff Street corridor can be met.

Traffic Operations

The Main Street intersection is experiencing operational problems due to insufficient number of turning lanes and the short storage lengths between the intersection and the interchange ramps. This area is congested and the northbound traffic backs up to and through the southbound I-15 ramp area on a regular basis. The operation of the intersection is also impacted by the short distance to the next adjacent intersection on Black Ridge Drive at Hilton Drive which is only 280 feet from the Main Street intersection.

The recommended interchange tight diamond reconfiguration helps this problem by providing additional storage distance between the two intersections. However, the intersection is over capacity and the interchange

Figure ES-1: Dixie Drive Interchange

reconfiguration will only provide marginal relief. In order to increase the capacity of the intersection, additional improvements are needed that will relocate the adjacent intersections to provide more separation between intersections.

Main Street Intersection Conclusions

The Main Street intersection will require some improvements that correspond with the Bluff Street interchange recommended improvements in order for the corridor to function. The first of these recommendations has already been done by the City of St. George in the restriping of the intersection to provide northbound to westbound dual left turn lanes. Additional widening will be required to add additional turn lanes and increase the widths of the lanes. This should be done in conjunction with the Bluff Street interchange reconfiguration. The exact nature of these improvements would be determined as part of the NEPA and design processes. The estimated cost for these improvements is included as part of the $14,000,000 cost for the Bluff Street Interchange reconfiguration.

To help ensure the longevity of the Main Street intersection, the intersection of Hilton Dr/Black Ridge Dr needs to be relocated to 250 West. The increased separation on Black Ridge Dr between the Main Street and Hilton Dr intersections has measurable benefits in terms of reduced delay, reduced queuing, and overall system operation improvements. This will be an important element in preserving the Bluff Street corridor and should be done as soon as possible. The estimated cost for relocating Hilton Drive is $1,500,000.

ST. GEORGE BOULEVARD INTERSECTION ANALYSIS

Results from the general Bluff Street corridor analysis indicated that the intersection of Bluff Street and St. George Blvd would have serious operational problems by the design year 2035. One important contributing factor to this problem is associated with the new replacement airport. When the new replacement airport goes into operation in 2011, it is anticipated that the current airport location will be abandoned. The property at this site is very valuable and will in all likelihood be sold for development. This fact, plus the normal growth on both Bluff Street and St. George Blvd indicate that this intersection will require major modifications in order to handle the projected traffic growth.

Alternatives Analysis

Nine options were analyzed as candidates for potential improvements to the St. George Blvd intersection. Three of the options were based on a standard intersection configuration and consisted of adding new lanes to some of the existing movements. Three of the options were based on a concept called a Continuous Flow Intersection (CFI). This is a new concept to the United States, but is presently being looked at by UDOT for consideration at other high volume intersections that are having operational problems. The last three options are based on improving operations by eliminating movements into and out of Airport Road. Each option is described below. The Base intersection option used for comparison purposes consists of the existing intersection configuration with a seven lane cross section on Bluff Street as implemented with the recent St. George Blvd reconstruction project. The nine options evaluated were:

1. Two southbound left turn lanes on Bluff St and one free westbound right turn lane on St. George Blvd
2. Two southbound left turn lanes on Bluff St and two westbound right turn lanes on St. George Blvd
3. Two southbound left turn lanes on Bluff St, one free westbound right turn lane on St. George Blvd, and a five lane section on Airport Rd
4. CFI- three lanes on Airport Rd and five lanes on Bluff St
5. CFI - five lanes on Airport Rd and five lanes on Bluff St
6. CFI - three lanes on Airport Rd, seven lanes on Bluff St, and no northbound left turn from Bluff St to Airport Road
7. Right-in-right-out only on Airport Rd with five lanes on Bluff St
8. Right-in-right-out only on Airport Rd with two through southbound lanes and three through northbound lanes on Bluff St

9. Right-in-right-out only on Airport Rd with two through southbound lanes and three through northbound lanes on Bluff St and Yield westbound rights on St. George Blvd

St. George Blvd Conclusions and Recommendations

The results of the analysis shows that a standard intersection configuration would need to include reconstructing Airport Road to a five lane section in order for the intersection to operate at a satisfactory level of service. Due to the high cost and environmental impacts to widen the Airport Road, it has a lower cost benefit. There is also the question if this can really be done geometrically or cost effectively due to the steep terrain in the area. The CFI configuration will work with seven lanes on Bluff St, however it requires the elimination of the northbound to westbound left turn movement. As the CFI is a new technology and would be the first of its kind in the area, there is concern with drivers being able to adjust to the concept. Movement restrictions on Airport Road will work with seven lanes on Bluff Street. Environmental impacts associated with any of the options would be mostly related to property and hillside impacts. Options 3, 6, and 8 are recommended to be pursued during the environmental phase of the project. The estimated cost of improvement is approximately $2,000,000 depending on which option is implemented and assuming Airport Road is not widened.

SUNSET BOULEVARD INTERSECTION

The existing configuration of the Sunset Blvd and Bluff Street intersection has operational problems due to the heavy directional movements for the northbound to westbound left turn and eastbound to southbound right turns. Because the intersection is a T intersection and the conflicting movements are light, the intersection presently operates at an acceptable level of service. However, traffic passing through the area often experiences delays in excess of 55 seconds and as the traffic volumes increase the intersection will suffer substantially longer delays and an unacceptable reduction in the level of service. This being the case, several options to improve the intersection were analyzed to provide recommendations that could be pursued in a subsequent environmental study.

Alternatives Analysis

There were five options for the Sunset Blvd intersection area that were evaluated as part of this study. All of the options assume that Bluff St will be a seven lane facility by 2035. The options consist of a various combinations of providing grade separation via a combination of overpass or underpasses for the key movements and realigning the intersection.

Sunset Blvd Conclusions and Recommendations

The option to provide an overpass for the southbound Bluff Street traffic has the most promise as it solves the capacity problems that are expected with the 2035 volumes by providing grade separation for two of the highest volume movements. As such,it is recommended as a reasonable alternative for further consideration in the NEPA environmental process. Environmental issues are expected to center around property impacts and Section 4(f) resources (golf course). The estimated costs for these improvements is $19,000,000.

SNOW CANYON PARKWAY/RED HILLS PARKWAY INTERSECTION

The existing configuration of the Snow Canyon Pkwy/Red Hills Pkwy intersection has two lanes in each direction. It is currently experiencing operational problems during peak traffic hours. As an alternate route to St. George Blvd from I-15 for the Santa Clara/Ivins and north Bluff St areas, it is seeing a large increase in traffic due to the high growth in these areas. Traffic operations analyses show that the intersection will fail under the existing geometry within the next ten years. Due to the high speeds, sight distance restrictions, and tremendous growth on both Bluff St and on Snow Canyon Pkwy/Red Hills Pkwy, the intersection is a good candidate for a grade separated configuration.

Alternatives Analysis

There were six options for the Snow Canyon Pkwy/Red Hills Pkwy intersection area that were evaluated as part of this study: two at grade options and four grade separated options. The grade separated options consist of various configurations for implementing an interchange. All options assume that there will be seven lanes on Bluff St south of the intersection and five lanes north of the intersection.

Snow Canyon Pkwy/Red Hills Pkwy Conclusions and Recommendations

The traffic growth on Snow Canyon Pkwy/Red Hills Pkwy shows that the intersection will require grade separation at some point in the future in order for the intersection to continue to function properly, safely, and at an acceptable level of service. There is some precedent for this at two intersections north of this point on Bluff St: the Ledges and the Trails interchanges. The summary of the analysis above indicates that an option to construct a tight diamond interchange with Bluff Street as the free flowing corridor has the highest benefit/cost ratio and the lowest delay.

At the same time this study was being done, a separate NEPA study was initiated on Red Hills Pkwy to look at alternatives to increase capacity on that facility. The Red Hills Pkwy study included the intersection at Bluff St. The recommendations for a grade separated interchange were given to the Red Hills Pkwy study team to be included in their analysis. The outcome of that study will include a NEPA based analysis and recommendation of a preferred alternative for the Snow Canyon Pkwy/Red Hills Pkwy intersection improvements. The estimated cost for this improvement is $12,000,000.

ACCESS MANAGEMENT

The City of St. George recognizes that good access management is of prime importance in providing a viable transportation system. The City understands that driveways are, in effect, at-grade intersections and that their number, size, and location will affect the traffic carrying capacity of the roadway system. The City also recognizes that the number of traffic crashes is disproportionately higher at driveways than at other intersections, thus their design and location merit special consideration.

All driveways associated with a new or expanded development must be reviewed to determine the impact on the roadway system. The segment south of St. George Blvd is generally in good condition for access location, spacing, and size. Few improvements could be made and none are recommended in this study. The segment north of St. George Blvd to Sunset Blvd is generally older development. Although this segment has made good progress over the recent years with respect to access management, some future planning will help to improve the integrity of the facility and are recommended as part of this report.

Three courses of action are recommended to be pursued with respect to the accesses along this segment as follows:

- The existing access is in a good location to serve the private development and has minimum impact on the roadway system. These accesses can generally remain in the future, but the access size should be reevaluated as part of a roadway reconstruction project.
- These accesses are too-closely spaced and do not meet current standards for location or size. However, closure or modification is not practicable at this time because it would have dramatic impacts on the property it serves. These accesses should be relocated, redesigned, or eliminated as the property develops and undergoes a change of use.
- These accesses have an impact on the operation of the roadway system. The access could be combined with another, relocated, or eliminated and will not have a major impact on the property it serves. These accesses should be modified as part of a roadway reconstruction project.

As additional corridor planning and redevelopment activities occur, each access location should be reviewed with respect to the above recommendations to determine the most appropriate course of action to ensure the safety and mobility of the corridor is maintained.